

(19) World Intellectual Property
Organization
International Bureau



529344

(43) International Publication Date
8 April 2004 (08.04.2004)

PCT

(10) International Publication Number
WO 2004/028238 A1

(51) International Patent Classification⁷: **A01C 1/04**

(21) International Application Number:
PCT/DK2002/000633

(22) International Filing Date:
25 September 2002 (25.09.2002)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant (for all designated States except US): **BENTLE PRODUCTS AG** [CH/CH]; Oberneuhofstrasse 5, CH-6341 Baar (CH).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **AHM, Poul, Henrik** [DK/ES]; Edf. Mar Bella, Atico A, 43, Calle San Pedro, E-03590 Altea (ES).

(74) Agent: **CHAS. HUDE A/S**; 33, H.C. Andersens Boulevard, DK-1780 Copenhagen V (DK).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declaration under Rule 4.17:

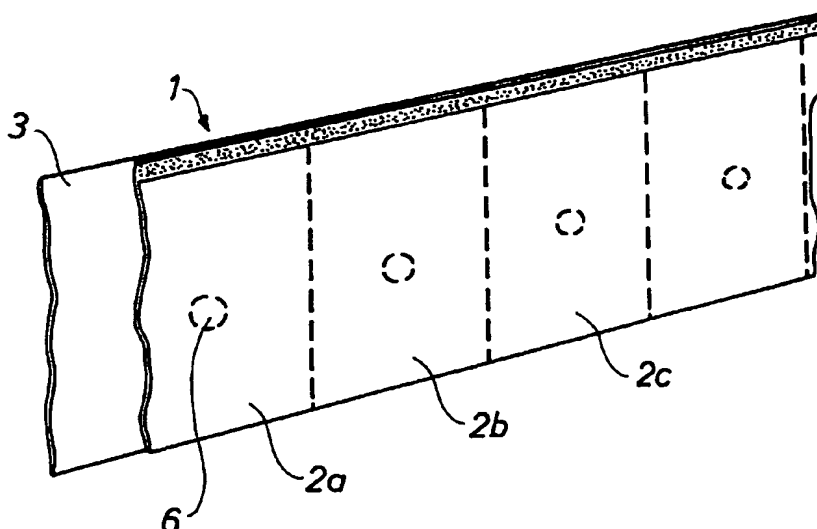
— of inventorship (Rule 4.17(iv)) for US only

Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: A SEED TAPE



(57) Abstract: A seed tape (1) includes successively arranged germinating units (2a, 2b, 2c) made of a plane material. These germinating units are coherent or secured to a carrier strip (3) of at least one layer of biodegradable material. Each germinating unit (2a, 2b, 2c) is intended to be bedded out in the ground (12) or a growth substrate and includes a mixture of carrier (7), at least one additive (9) and optionally adjuvants (8) in addition to one or more seeds (6). The additive or additives (9) include water-absorbing materials, such as superabsorbing polymers. Each germinating unit (2a, 2b, 2c) is provided with at least one narrow zone (5) of water-repellent material across its surface adjacent or at least up to the upper edge of said unit. The material of the narrow zone penetrates the plane material of the germinating unit (2a, 2b, 2c) throughout the entire thickness thereof. As a result, the seed tape is not easily subjected to a drying up due to sun and wind although the upper end of said seed tape should project slightly from the ground.

WO 2004/028238 A1

Title: A Seed TapeTechnical Field

The invention relates to a seed tape including successively arranged germinating units made of plane material and being coherent or secured to a carrier strip of at least one layer of biodegradable material, and where each germinating unit is intended to be vertically bedded out in the earth or in a growth substrate and in addition to one or more seeds includes a mixture of carrier, at least one additive and optionally a filler and adjuvants, and where the additive or the additives include water-absorbing materials, such as superabsorbing polymers.

10 Background Art

When the tape is to be vertically positioned, the bedding out of a seed tape is encumbered with the problem that said seed tape is not positioned sufficiently deeply in the earth. A small piece of the upper end of the tape projects from the earth, and long periods of windy weather or sunshine imply that the germinating units of the seed tape dry up because each germinating unit acts as a wick for the transport of the moisture to the surface of the ground, and accordingly the wind or sun dries up the germinating units through the projecting end of the seed tape. The latter is a rather unsatisfactory effect.

Brief Description of the Invention

20 The object of the invention is to provide a seed tape of the above type and which ensures that although a small piece of the seed tape projects from the ground then the germinating units are not easily dried up.

The seed tape according to the invention is characterised in that each germinating unit

is provided with at least one narrow zone of water-repellent material across said unit, adjacent or at least up to the upper edge of said unit, where the water-repellent material penetrates the plane material of the germinating unit throughout the entire thickness thereof. As a result, each germinating unit is provided with a water-repellent barrier or seal in the upward direction, said barrier or seal completely eliminating, optionally considerably reducing the moisture-evaporating tendency of the upper end of said germinating units.

According to the invention the water-repellent material may be silicone or silicone oil which turned out to be particularly easy to apply and being very efficient in practice.

Furthermore, the narrow zone of water-repellent material may according to the invention be of a height of at least 1 mm, which turned out to be particularly advantageous.

In addition, the narrow zone of water-repellent material may according to the invention be of a height of 3.5 to 10 mm, preferably 4 to 8 mm, especially 5 mm. These widths turned out to be particularly advantageous.

According to the invention, the narrow zone of water-repellent material may be of a height of 5 to 10% of the height of the germinating unit, which turned out to be a particularly advantageous embodiment.

Moreover, the plane material of the germinating units may according to the invention be paper, preferably of a weight of 30 to 60 g/m², especially 40 to g/m², where the carrier strip may be made of paper as well. The resulting seed tape is both inexpensive and efficient.

According to the invention, the water-repellent material may be wax, stearin, paraffin or caoutchouc applied onto the plane material of the germinating unit as a hot melt

and subsequently cured. These substances and this way of application turned out to provide a particularly efficient barrier on top of the individual germinating units.

According to the invention, the water-repellent material may be plastics, such as polylactide (PLA), optionally polylactide (PLA) plus polysaccharides. In this manner
5 the resulting water-repellent barrier is mechanically strong, and accordingly it presents an improved tolerance to animals or birds.

Furthermore, a narrow zone of water-repellent material may be provided at or adjacent the lower edge of each germinating unit. As a result, the water contained in each germinating unit is not immediately passed downwards into the ground in the situation
10 where the seed tape is bedded out in particularly dry ground. In addition it is ensured that the lower portion of the seed tape ensures an improved water-air proportion at the lower portion of the germinating units while said seed tape is placed in a bedding out box.

According to the invention, the tape may be continuously manufactured as the germinating units may be manufactured by means of one or more paper ribbons of a width
15 twice the width of the completed tape, a zone of water-repellent material of a double width being applied onto the centre of said paper ribbon or ribbons, whereafter said ribbon or ribbons are subsequently slotted through the centre of the water-repellent zone. The resulting seed tape is particularly inexpensive.

20 Moreover, a deterrent may according to the invention be added to the water-repellent material, said deterrent preferably being a substance affecting the sense of smell or taste of animals or birds. In this manner the tendency of animals or birds picking in and optionally damaging the seed tape has been reduced.

Finally, the narrow water-repellent zone may according to the invention at the ends
25 be extended a short distance downwards along the vertical edges of each germinating

unit, such as for instance 2 to 5 mm. In this manner the tendency of water evaporating from the ends of the germinating units projecting beyond the ground has been further reduced.

In the introduction to the description it is mentioned that each germinating unit includes a mixture of carrier, at least one additive and optionally adjuvants in addition to one or more seeds. The term "carrier" is here *inter alia* to be construed as one or more of the substances: silica, vermiculite, perlite, zeolite, cellulose materials, such as wood fibres and sphagnum, clay, optionally burned clay, mineral fibres, such as rock wool or the like substances, whereby it is possible to obtain a desired degree of water retaining capacity, water conveying capacity, ion exchanging properties etc. The term "adjuvants" are here in principle to be construed as all substances compatible with the remaining, selected substances, and as substances with a favourable effect on the storing, the germination and the growth of the seed and the later sprout. The adjuvants can for instance include: pesticides, including herbicides, insecticides, especially systemic insecticides, fungicides, virae, cultures of bacteria, cultures of fungi, such as *Trichoderma*, fungus spores, microencapsulated fungicides, eggs from useful insects, such as predatory nematodes, insect eggs, fertilizers, hormones, enzymes, animal repellants, pH-adjusting agents, carbon, clay particles, trace elements, such as molybdenum, wood fibres or wood powder, kieselguhr, surfactants, silica and other additives with a favourable effect on the germination and the growth of plants, where several substances are available in microencapsulated form with the result that they are protected against biodegradation and a controlled release thereof can be carried out. The adjuvants can also include potassium nitrate and sodium chloride.

These substances can optionally be joined by means of a binder, which for instance includes polyvinyl alcohol, polyethylene glycol or other plant-compatible binders, such as water or water containing polysaccharides or mixtures thereof.

Brief Description of the Drawings

The invention is explained in detail below with reference to the drawing, in which

Fig. 1 illustrates an embodiment of a seed tape according to the invention,

- 5 Fig. 2 is a perspective view of a germinating unit including a zone of water-repellent material at the top,

Fig. 3 is a perspective view of a portion of a seed tape bedded out in the ground, a small portion of said seed tape projecting beyond the surface of the ground,

- Fig. 4 is a perspective view of a germinating unit provided with a narrow zone of
10 water-repellent material both at the top and at the bottom,

Fig. 5 is a perspective view of a germinating unit, where the narrow zone of water-repellent material at the top has been carried a short distance downwards along the two vertical edges of the germinating unit, and

- Fig. 6 is a perspective view of a portion of a continuous length suited for the manu-
15 facture of the germinating unit according to the invention.

Best Mode for Carrying Out the Invention

- The seed tape 1 shown in Fig. 1 includes successively arranged germinating units 2a, 2b, 2c etc., which can be coherent or secured to a carrier strip 3. The carrier strip 3 is formed by at least one layer of biodegradable material, and each germinating unit
20 2a, 2b, 2c is made of a plane material, preferably paper, in one or more layers. The seed tape and consequently each germinating unit are intended to be vertically bedded out in the ground or in a suitable growth substrate. In addition to one or more seeds

6, each germinating unit includes a mixture of carrier 7, at least one additive 9 and optionally adjuvants 8. All these substances encircle the seed 6. They can for instance be glued onto the germinating unit by means of a binder not shown.

As illustrated in Fig. 2, each germinating unit 2a is provided with at least one narrow zone 5 of water-repellent material across said unit, adjacent or at least up to the upper edge 4 of said unit, where the narrow zone penetrates the plane material of the germinating unit throughout the entire thickness thereof.

The narrow zone 5 can have a height h of at least 1 mm. The height h can also be in the range 3.5 to 10 mm. The height h is preferably 4 to 8 mm, especially 5 mm. h can also be 5 to 10% of the height H of the germinating unit. The plane material of the germinating units 2a, 2b, 2c etc. can be paper, preferably paper of a weight of 30 to 60 g/m², especially 40 to 50 g/m². The carrier strip 3 can also be made of paper.

The water-repellent material of the narrow zone 5 can be silicone or silicone oil. The water-repellent material of the above zone can also be wax, stearin, paraffin or caoutchouc applied onto the plane material of the germinating unit as a hot melt and subsequently cured.

In addition, the water-repellent material of the narrow zone 5 can be plastics, such as polylactide (PLA), optionally polylactide (PLA) plus polysaccharides.

Fig. 3 shows how the upper end of a seed tape 1 bedded out can project slightly by mistake from the ground, i.e. beyond the surface 12 of the ground. Without the above zone 5 of water-repellent material a risk applies of the moisture contained in the germinating unit penetrating upwards through said germinating unit so as to evaporate above the surface of the ground. The latter applies in particular to the situation where the bedding out site is subjected to much wind and/or where the sun is shining on the projecting portion of the seed tape. The zone 5 of water-repellent material prevents

the disadvantageous evaporation of water from the germinating unit.

As illustrated in Fig. 4, each germinating unit 2a, 2b, 2c can be provided with a narrow zone 5' of water-repellent material at its lower edge 14 as well with the result that the release of water to a dry ground below said germinating unit is considerably reduced.

- 5 Fig. 6 shows how a seed tape can be manufactured by means of continuous webs of paper 16, 17. These webs are of a width corresponding to twice the height of a germinating unit. A zone 15 of water-repellent material is applied onto the centre of the web, said zone 15 being of a width which is equal to 2h. When the webs 16, 17 are slotted at the centre, i.e. along the line o, the complete seed tape is almost obtained.
- 10 A carrier strip 3 must, however, be glued onto the web, optionally after the separation of the individual germinating units 2a, 2b, 2c. In the latter situation, the germinating units present a predetermined mutual distance and are glued to the carrier strip 3.

The water-repellent material of the zone 5, 5' can be admixed a deterrent, preferably a substance affecting the sense of smell or taste of animals or birds.

- 15 As illustrated in Fig. 5, the narrow zone 5 of water-repellent material can be extended at the ends a short distance downwards, cf. at 5a and 5b, whereby the zone extends slightly downwards along the vertical edges 18a and 18b of each germinating unit 2a.

- In connection with the additive or additives 9 included in the mixture of substances encircling the seed 6, cf. above, it should be noted that it is a question of one or more
- 20 water-absorbing materials, such as superabsorbing polymers (SAP). These materials can for instance be cross-linked polyacrylic acids, cross-linked isobutylene-maleic acid-copolymer derivatives, salts of cross-linked starch-polyacrylic acid, salts of cross-linked polyvinylalcohol-polyacrylic acids, cross-linked polyvinylalcohol derivatives, cross-linked polyethylene-glycol derivatives and cross-linked
- 25 carboxymethylcellulose derivatives. When watered, the water-absorbing materials can

include large amounts of water of benefit to the seed 6. The purpose of the narrow zone 5 of water-repellent material is to avoid loss of water from the additive or the additives 9.

The invention may be modified in many ways without thereby deviating from the
5 scope of the invention.

Claims

1. A seed tape (1) including successively arranged germinating units (2a, 2b, 2c) made of plane material and being coherent or secured to a carrier strip (3) of at least one layer of biodegradable material, and where each germinating unit (2a, 2b, 2c) is intended to be vertically bedded out in the earth (12) or in a growth substrate and in addition to one or more seeds (6) includes a mixture of a carrier (7), at least one additive (9) and optionally a filler and adjuvants (8), and where the additive or the additives (9) include water-absorbing materials, such as superabsorbing polymers, characterised in that each germinating unit (2a, 2b, 2c) is provided with at least one narrow zone (5) of water-repellent material across said unit, adjacent or at least up to the upper edge of said unit, where the water-repellent material penetrates the plane material of the germinating unit throughout the entire thickness thereof.
2. A seed tape as claimed in claim 1, characterised in that the water-repellent material of the narrow zone (5) is silicone or silicone oil.
3. A seed tape as claimed in claim 1 or 2, characterised in that the narrow zone (5, 5') of water-repellent material is of a height (h) of at least 1 mm.
4. A seed tape as claimed in claim 1, 2 or 3, characterised in that the narrow zone (5, 5') of water-repellent material is of a height of 3.5 to 10 mm, preferably 4 to 8 mm, especially 5 mm.
5. A seed tape as claimed in one or more of the claims 1 to 4, characterised in that the narrow zone of water-repellent material is of a height (h) of 5 to 10% of the height (H) of the germinating unit.
6. A seed tape as claimed in one or more of the claims 1 to 5, characterised in that the plane material of the germinating units (2a, 2b, 2c etc.) is paper, preferably

of a weight of 30 to 60 g/m², especially 40 to 50 g/m², and that the carrier strip (1) is made of paper as well.

7. A seed tape as claimed in claim 1, characterised in that the water-repellent material of the narrow zone (5, 5') is wax, stearin, paraffin or caoutchouc applied onto the plane material of the germinating unit as a hot melt and subsequently cured.

8. A seed tape as claimed in claim 1, characterised in that the water-repellent material of the narrow zone (5, 5') is plastics, such as polylactide (PLA), optionally polylactide (PLA) plus polysaccharides.

9. A seed tape as claimed in one or more of the claims 1 to 8, characterised in that a narrow zone (5') of water-repellent material is provided at or adjacent the lower edge (14) of each germinating unit (2a, 2b, 2c).

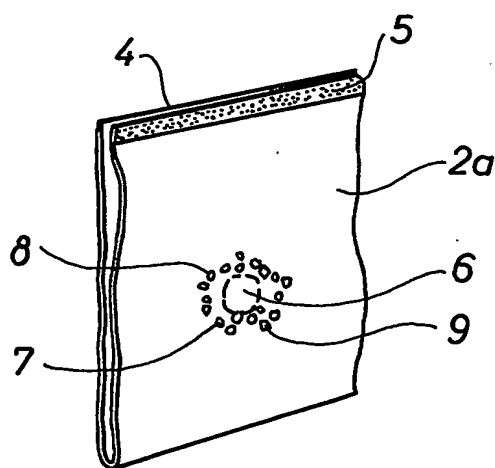
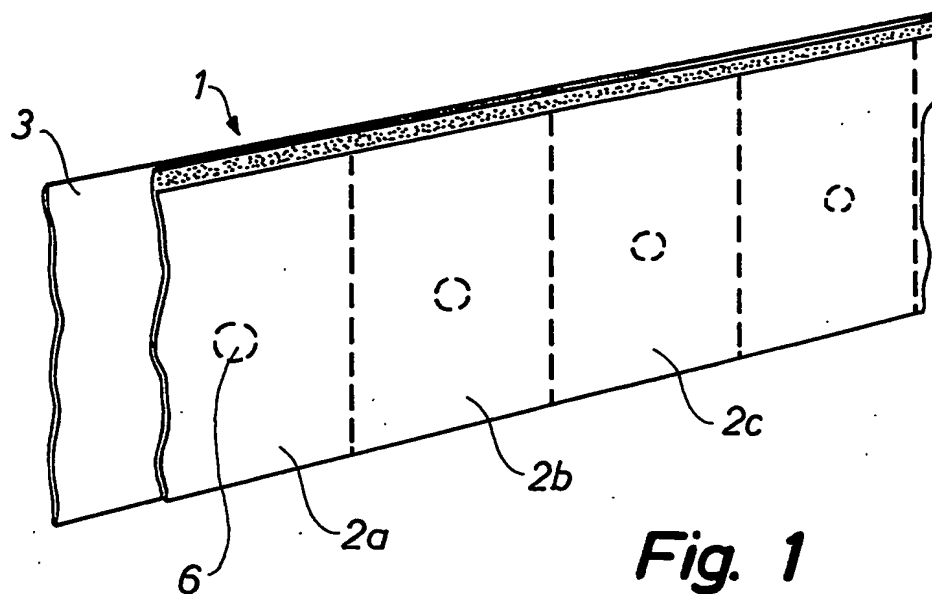
10. A seed tape as claimed in one or more of the claims 1 to 9, characterised in that said tape is continuously manufactured as the germinating units (2a, 2b, 2c etc.) are manufactured by means of one or more paper ribbons (16, 17) of a width twice the width of the completed seed tape, a zone (15) of water-repellent material of a double width being applied onto the centre of said paper ribbon, whereafter said paper ribbon or ribbons (16, 17) are slotted (o) through the centre of the water-repellent zone (15).

11. A seed tape as claimed in one or more of the claims 1 to 10, characterised in that a deterrent is added to the water-repellent material of the narrow zone (5, 5'), said deterrent preferably being a substance affecting the sense of smell or taste of animals or birds.

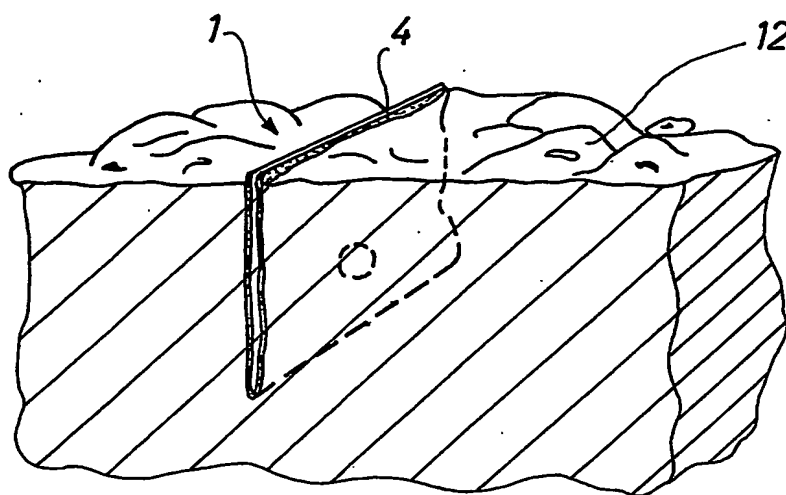
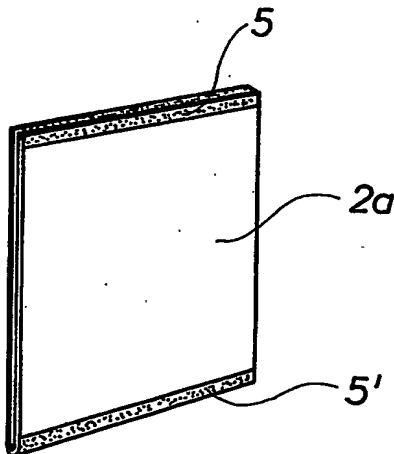
12. A seed tape as claimed in one or more of the claims 1 to 11, characterised in that at the upper edge (4) of the germinating unit, the narrow zone (5) of

water-repellent material is extended slightly downwards (5a, 5b) along the vertical edges (18a, 18b) of said germinating unit (2a, 2b, 2c).

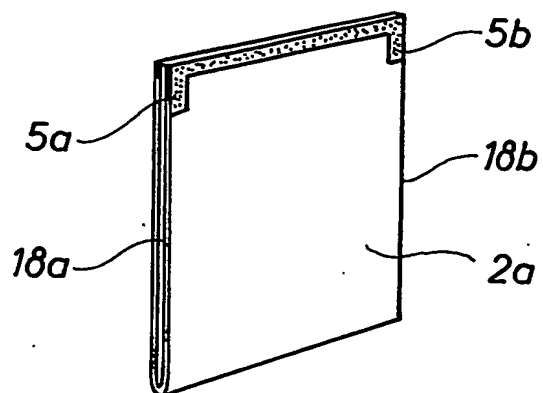
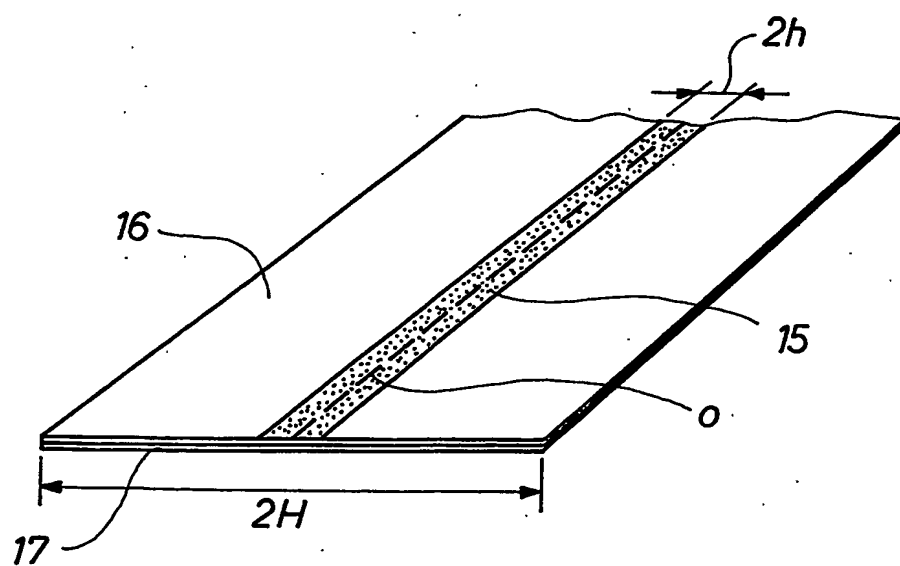
1/3



2/3

**Fig. 3****Fig. 4**

3/3

**Fig. 5****Fig. 6**

INTERNATIONAL SEARCH REPORT

Application No
PCT/DK 02/00633

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A01C1/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A01C A01G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4 453 369 A (ESTKOWSKI MICHAEL H) 12 June 1984 (1984-06-12) column 4, line 60-68 abstract; figure 8	1-12
Y	WO 01 56361 A (BENTLE PRODUCTS AG ;AHM POUL HENRIK (ES)) 9 August 2001 (2001-08-09) page 6, line 19-25 abstract; figure 7	1-12
A	GB 1 041 133 A (WILLIAM JOHN HARRIS) 1 September 1966 (1966-09-01) column 2, line 62-80 column 8, line 15-18; claim 1	1-9,12
	-/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

6 December 2002

Date of mailing of the international search report

30.12.2002

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

ALEXANDRA JARLMARK/JA

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/DK 02/00633

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 471 569 A (AHM POUL H ET AL) 18 September 1984 (1984-09-18) column 1, line 34-46; claim 1 ---	1
A	WO 02 19797 A (SCHÖBER WALTER ;BIOINNOVA VERBUNDBAUTEILE GMBH (AT)) 14 March 2002 (2002-03-14) page 4, line 13-21 abstract; figure 1 -----	9

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/DK 02/00633

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4453369	A	12-06-1984	US 4353183 A	12-10-1982
WO 0156361	A	09-08-2001	DK 200000178 A	04-08-2001
			AU 2833401 A	14-08-2001
			WO 0156361 A1	09-08-2001
			EP 1253819 A1	06-11-2002
GB 1041133	A	01-09-1966	NONE	
US 4471569	A	18-09-1984	DK 173381 A	16-10-1982
			AU 546287 B2	22-08-1985
			AU 8391682 A	04-11-1982
			BR 8207657 A	29-03-1983
			CA 1193863 A1	24-09-1985
			DE 3265025 D1	05-09-1985
			WO 8203527 A1	28-10-1982
			EP 0076833 A1	20-04-1983
			ES 8401821 A1	01-04-1984
			FI 824219 A ,B,	08-12-1982
			GR 76699 A1	28-08-1984
			HU 33944 A2	28-01-1985
			IT 1151134 B	17-12-1986
			MX 159636 A	20-07-1989
			NO 824201 A ,B,	14-12-1982
			RO 86466 A1	15-03-1985
WO 0219797	A	14-03-2002	WO 0219797 A1	14-03-2002
			AU 6972900 A	22-03-2002